

29640 - Electric Mobility

Syllabus Information

Academic year: 2024/25

Subject: 29640 - Electric Mobility

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 430 - Bachelor's Degree in Electrical Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Optional

Module:

1. General information

The main objective of the subject is for the student to learn about the different degrees of electrification of electric vehicles: semi-hybrid, HEV, PHEV, FCEV, and BEV. The technologies necessary for its development include electric motors, batteries, and power electronics. The charging methods and technologies are slow, moderate, and fast; different modes are conductive and inductive, and the relationship with the smart grid is also studied.

2. Learning results

- To understand the needs that force the change from combustion vehicles to electric vehicles To know the topology of pure electric and hybrid electric vehicles.
- Calculation of the energy needs of an EV
- Understanding EV and PHEV charging procedures
- To learn about energy storage technologies in EVs and PHEVs
- Analyze electric traction systems in EVs
- Study the power converters required in EVs
- To know the necessary infrastructures for EV power supply
- Identify the network impact of EV charging and how to solve it
- Linking electric mobility and the Smartgrid
- Model an electric vehicle with Matlab-Simulink, and calculate its power, torque, and energy requirements, dimensioning the battery pack

3. Syllabus

- Introduction: electric vehicle and Smartgrid
- The need for electric mobility: consumption of fossil fuels, environmental and health impact.
- Brief history of electric mobility
- Types of low-emission vehicles and their technologies: micro-hybrid, semi-hybrid, HEV, PHEV, FCEV
- Pure electric vehicle. Advantages and disadvantages. Comparison of consumption and contaminant emissions.
- ELV technologies: motors, batteries, power electronics
- Electric vehicle charging: types, regulations, and standards
- Impact of electric mobility on the power system, transmission grid and distribution network.
- Importance of electric vehicles for the smart-grid.

4. Academic activities

A01. Lectures (presentation of contents by the teaching staff or external experts to all the students of the subject): 25 hours

A02. Problem solving and case studies: practical exercises with all the students of the subject. 20h A03. Laboratory practice (carrying out practical exercises in small groups of students of the subject) 15h A05 Practical research or application work.30 h

A06 Personalized tutoring teacher-student, face-to-face, email, or online. 10 h

A07 Self-study by the student. 45 h

A08 Evaluation tests. 5h

5. Assessment system

The evaluation is mixed: work done by the student throughout the subject, practices and a theoretical test type test, short

questions, and problems at the end of the subject.

The theoretical test weighs 50%; the assignments, which are assigned throughout the course and term, presented publicly, 30%; the practicals, which are obligatory, 20%, and which will end with the delivery of a completed script.

In accordance with the regulations of the University of Zaragoza, in this regard, in the subjects that have continuous or gradual assessment systems, a global assessment test will also be scheduled for those students who decide to opt for this second system. The second call for assessment will be carried out using a global test carried out in the period established for this purpose in the academic calendar.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption
13 - Climate Action